

# Amendment to the Basin Plan for the --- Control of Nutrients in Clear Lake

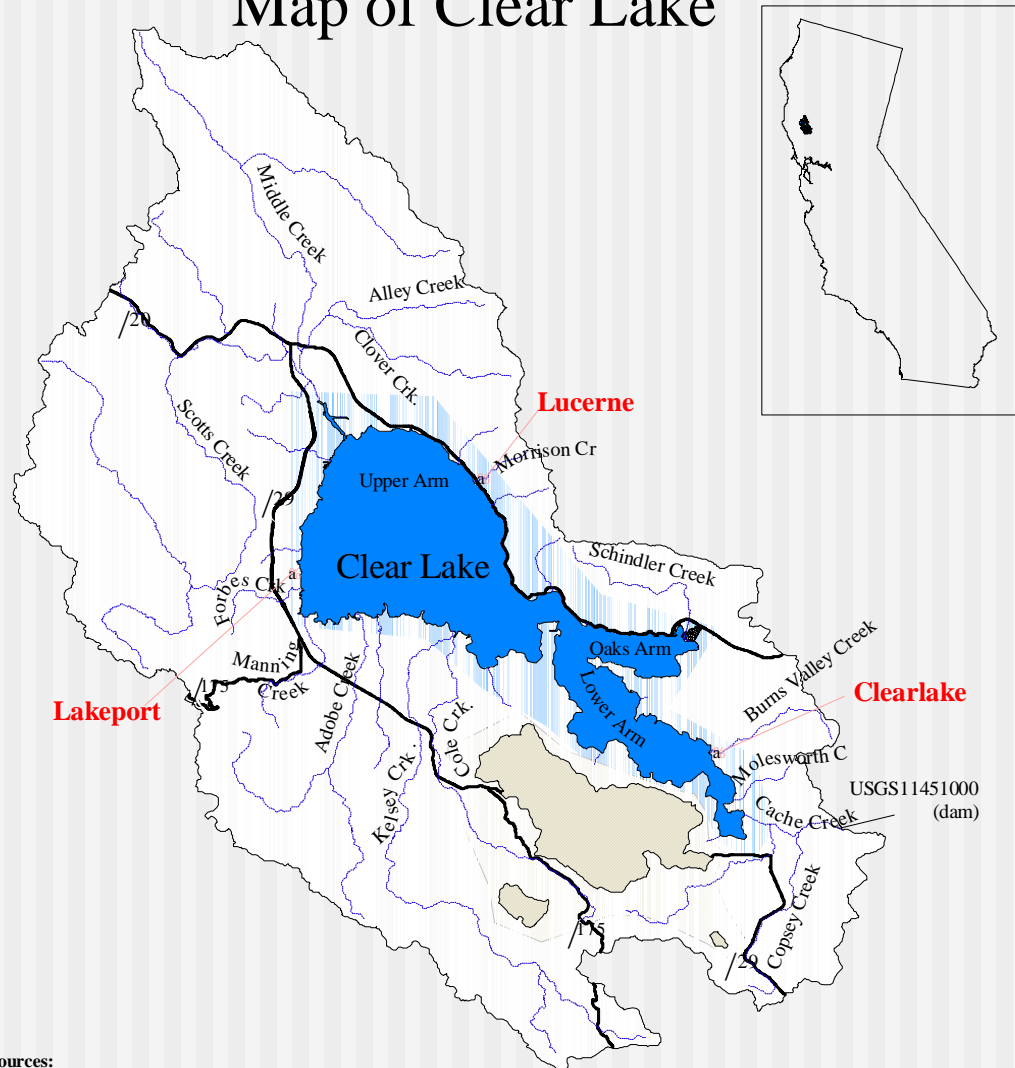


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# Goals of Presentation

- Background information
- Overview of BPA
- Target and load allocations
- Implementation

# Map of Clear Lake



Data Sources:  
USGS National Hydrography Dataset  
Lake County Department of Public Works

Projection: California II State Plane 1983

# Nutrients in Clear Lake

- Clear Lake is naturally “eutrophic” or nutrient rich
- Algae and other aquatic plants have always been present in the lake.
- Accounts from 1874 speak of “deep, dense moss” and “green scum”

# Nutrients in Clear Lake

- The algae problem has worsened since the 1920s and 1930s
- Nuisance blooms of blue-green algae have become common occurrences
- Water clarity decreases in late summer and fall due to algae

# Algae Bloom of 1990

- “scums covering tens of acres up to 1 meter thick”
- “too thickly clogged for small boats to navigate”
- “Odors drove seasoned permanent residents from their homes”

Source: The Causes and Control of Algal Blooms in Clear Lake, 1994

# Algae

- Blue-green algae
- Floating cells or colonies
- Ability to form dense mats or scums
- Nuisance to swimmers and boaters
- Adversely affect wildlife and drinking water

# Narrative Standard

- Basin Plan states: “*water shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses*”



# Clear Lake is Impaired

- Due to nuisance algae blooms beneficial uses are not being achieved in the lake
- Listed since 1975
- Federal and State regulations require us to develop a control program to address the impairment

# Control Program

- Meets Federal and State Requirements including Federal Total Maximum Daily Load (TMDL) requirements
- Adopted into the Basin Plan through a Basin Plan Amendment
  - Numeric target
  - Pollutant load allocations
  - Implementation program
  - Time schedule and monitoring

# Role of Phosphorus

- Algae need the nutrients **nitrogen** and **phosphorus** for growth
- Studies conclude phosphorus reduction will reduce algal blooms

# Phosphorus Loading

- External loading
  - Erosion from surrounding watershed
  - Sewer and septic overflows
  - Urban and agricultural fertilizer use
- Internal loading
  - Summer and fall
  - Decomposing algae reduce oxygen in sediments
  - Phosphorus is released and fuels further algae growth.

# Potential Causes of Erosion

- Roads
- Gravel mining
- Construction
- Agriculture
- Timber
- Grazing
- Urban stormwater
- Off highway vehicles
- Invasive species
- Wildfires and control burns

# Other Influences on Algae

- Nitrogen
- Iron
- Food web interactions

# Computer Models

- Developed by Tetra Tech
- Incorporated 30+ years of water quality data from DWR and others
- Used two computer models to model the watershed and the lake

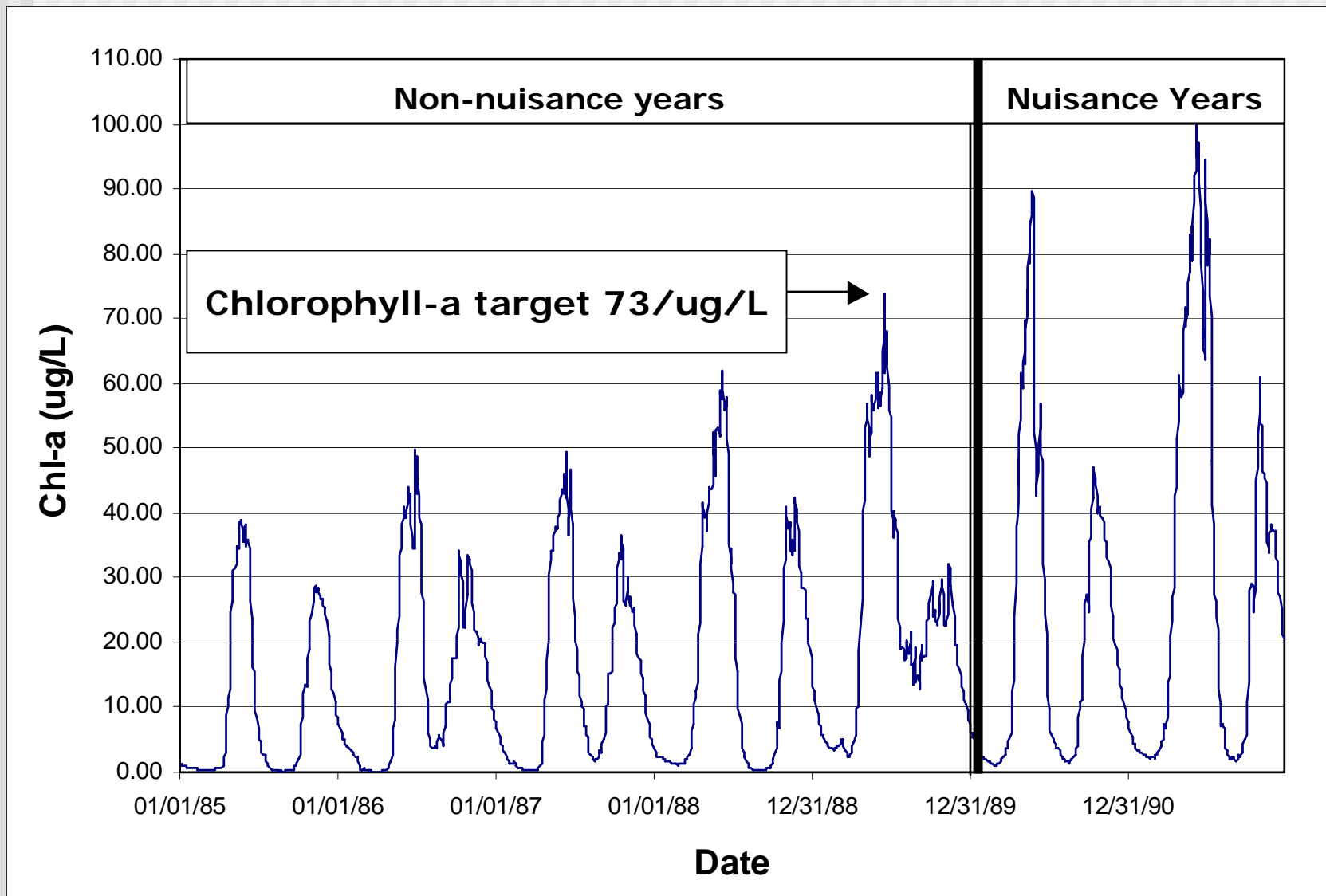
# Watershed Model

- Incorporates land use, hydrology, rainfall and other watershed data
- Estimates nutrient and sediment loads to lake
- Watershed loads



# Lake Model

- Incorporates outputs from the watershed model as inputs
- Models within lake processes such as temperature, residence time, mixing and algae growth
- Simulates chlorophyll-a concentrations (surrogate for algae growth)



Proposed Loading  
Allocation =  
87,100 kg P/yr

A 40% reduction

# Point Sources

- NPDES Permittees
- Responsible Parties
  - Caltrans
    - Waste load allocation – 100 kg P/yr
  - Stormwater permittees
    - Waste load allocation – 2,000 kg P/yr

# Nonpoint Sources

- Load allocation is 85,000 kg P/yr
- Responsible parties
  - Lake County
  - US Bureau of Land Management
  - US Forest Service
  - Irrigated agriculture

# Proposed Implementation Plan

- Adaptive implementation
- Reports or management plans
- Continued studies
- BMP implementation

# Management Plans

- Required of Irrigated Agriculture
- Due December 2011 and 2016
  - Describe phosphorus reduction activities
  - Estimate loading from irrigated lands

# Reports

- Required by all RPs except irrigated agriculture
- Due December 2011 and 2016
  - Phosphorus loading estimates (computer modeling or monitoring)
  - Actions implemented and planned to control phosphorus



# Reports (continued)

- Unpaved roads
- Grazing (USFS, BLM)
- Septic tanks (County)
- Evaluation of conditions in the lake (County)

# Continued Studies

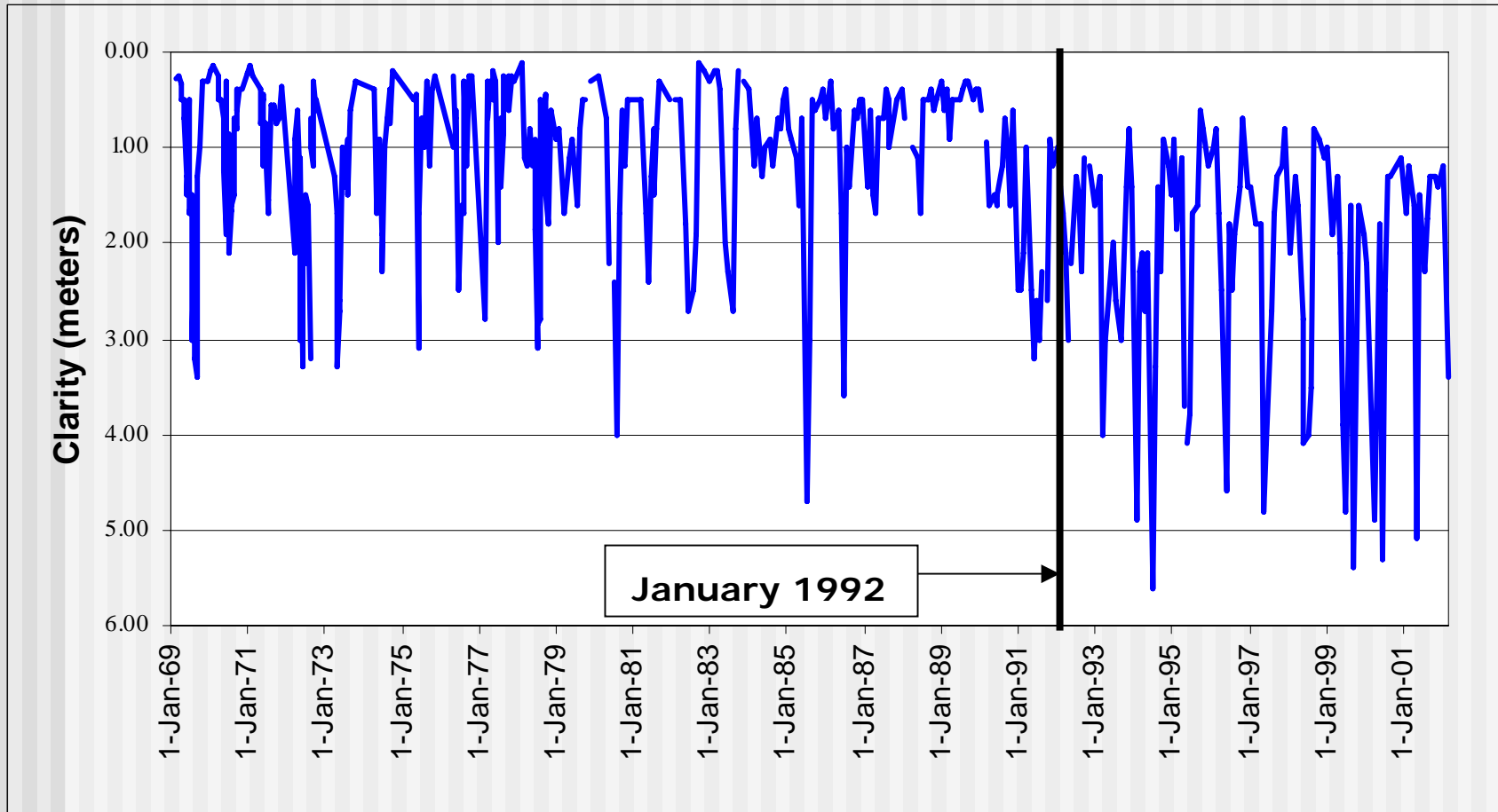
- Evaluate chlorophyll-a target and load allocations
- Role of nitrogen, iron and food web interactions

# BMP Implementation

## Existing Efforts

- Full circle effluent pipeline
- Middle Creek Flood Damage Reduction and Ecosystem Restoration Project
- East and West Lake RCDs
- Stormwater permits (inc. grading ordinance)
- Timber waiver
- Irrigated Lands Program
- Water Quality Certification Program

# Recent Improvements in Water Clarity



# BMP Implementation

- Adaptive management
- Further implementation activities may be necessary

# Additional Considerations

- Concerns about cost
- Can we implement a more efficient and cost effective approach?
- Can we reduce costs and still accomplish program goals?

# Conclusion

- Impairment due to blue-green algae
- Phosphorus drives algae growth
- Phosphorus enters the lake via erosion
- Proposed BPA would implement control plan
- Improvements in water quality need verification

# Next Steps

- Staff report released for public review
- Respond to comments
- Hearing on June 22/23
- Initial Source Estimates